

We Claim:

1. A lead-free bullet, comprising:

a body made from a composite polymer material and having a front end and a rear end;

a cannellure formed on an outer circumferential surface of the body intermediate the front and rear ends of the body, wherein the composite polymer material includes a tungsten metal powder, nylon 6/6, nylon 6, and glass fibers; and

a specific gravity in a range of 3-10.

2. The bullet according to claim 1, wherein the tungsten metal powder is 50%-96% of a weight of the bullet body, the nylon 6/6 is 0.5%-15% of the weight of the bullet body, the nylon 6 is 0.5%-15% of the weight of the bullet body, and wherein the glass fibers are 0.5%-15% of the weight of the bullet body.

3. The bullet according to claim 2, wherein the tungsten metal powder is 60%-95% of the weight of the bullet body, the nylon 6/6 is 1.0%-12% of the weight of the bullet body, the nylon 6 is 1.0%-12% of the weight of the bullet body, and wherein the glass fibers are 1.0%-12% of the weight of the bullet body.

4. The bullet according to claim 3, wherein the tungsten metal powder is 70%-90% of the weight of the bullet body, the nylon 6/6 is 2.0%-9.0% of the weight of the bullet body, the nylon 6 is 2.0%-9.0% of the weight of the bullet body, and wherein the glass fibers are 2.0%-9.0% of the weight of the bullet body.

5. The bullet according to claim 1, wherein the specific gravity of the bullet is in the range of 6-9.

6. The bullet according to claim 5, wherein the specific gravity of the bullet is in the range of 7.5-8.5.

7. The bullet according to claim 1, wherein the tungsten metal powder is encapsulated in the composite polymer material.

8. A lead-free cartridge case capable of holding a bullet having a cannelure formed along an outer circumferential surface of a body of the bullet, the cartridge case comprising:

- a cylindrical body manufactured from a composite polymer and having a front end and a rear end opposite the front end;

- a mouth defined by the front end of the body;

- engaging means for engaging the bullet, the engaging means being disposed along a perimeter of the mouth;

- a groove formed along an outer circumferential surface of the body in a vicinity of the rear end of the body;

- a web extending radially inward relative to the body and disposed intermediate the groove and the mouth, wherein the web separates a bullet holding chamber located on a front end side of the web from a primer holding chamber located on a rear end side of the web; and

- walls of the body which define the bullet holding chamber and are bendable in a direction toward and away from a longitudinal axis of the body, wherein the engaging means are configured to snap fit the cannelure of the bullet.

9. The cartridge case according to claim 10, wherein the walls defining the bullet holding cartridge include tapered walls arranged oblique relative to the

longitudinal axis of the body and straight walls arranged parallel relative to the longitudinal axis of the body, wherein the tapered walls taper away from the longitudinal axis of the body in a direction from the rear end to the front end of the body and transition to the straight walls at a blend point.

10. The cartridge case according to claim 9, wherein the engaging means include a lip lock having either one of an asymmetrical configuration or a symmetrical configuration.

11. The cartridge case according to claim 10, wherein the lip lock includes a base portion parallel relative to the longitudinal axis of the body and coinciding with the outer surface of the body, a tapered portion arranged oblique relative to the longitudinal axis of the body, and an engaging portion, wherein the engaging portion is configured to fit within the cannellure of the bullet.

12. The cartridge case according to claim 11, wherein the engaging portion is either one of parallel or oblique relative to the base portion.

13. The cartridge case according to claim 8, wherein the groove defines a rim at the rear end of the body and wherein an outer diameter of the rim is equal to or less than an outer diameter of the rear end of the body.

14. The cartridge case according to claim 8, wherein the groove defines a rim at the rear end of the body and wherein an outer diameter of the rim is equal to or greater than an outer diameter of the rear end of the body.

15. The cartridge case according to claim 8, further comprising a flash hole provided in the web, wherein the bullet holding chamber communicates with the primer holding chamber through the flash hole.

16. The cartridge case according to claim 8, wherein the composite polymer includes a tungsten metal powder, nylon 6/6, nylon 6, glass fibers, and optionally additives and/or stabilizers.

17. A method for manufacturing a lead-free bullet having a body made from a composite polymer material including tungsten metal powder, nylon 6/6, nylon 6, and glass fibers, the method comprising the following steps:

providing a mold configured to a predetermined caliber bullet; and

feeding the composite polymer material through an injection molding apparatus into the mold.

18. A method for manufacturing a lead-free cartridge case having a body made from a composite polymer material including tungsten metal powder, nylon 6/6, nylon 6, and glass fibers, the method comprising the following steps:

providing a mold configured to a predetermined caliber cartridge case; and

feeding the composite polymer material through an injection molding apparatus into the mold.

19. A method for manufacturing a lead-free cartridge case having a body including a case portion and a base portion, each portion being made from a composite polymer material including tungsten metal powder, nylon 6/6, nylon 6, and glass fibers, the method comprising the following steps:

providing a mold configured to a predetermined caliber base portion;

providing a mold configured to a predetermined caliber case portion;

feeding the composite polymer material through an injection molding apparatus into the respective molds; and

welding the formed base portion to the formed case portion using any one of ultrasonic, spin, or laser welding.